

FORM PTO-1396
(REV. 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

MULL 101

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (if known, see 37 CFR 1.5)

09/787172

INTERNATIONAL APPLICATION NO.
PCT/EP99/06594INTERNATIONAL FILING DATE
07 September 1999 (07.09.99)PRIORITY DATE CLAIMED
14 September 1998 (14.09.98)TITLE OF INVENTION
SYSTEM FOR MEASURING THE SURFACE GEOMETRY AND SURFACE EVENNESS OF FLAT PRODUCTSAPPLICANT(S) FOR DO/EO/US
Ulrich Muller, Detlef Winter, Detlef Sonnenschein, Rudolf Stockmeyer, and Gustav Peuker

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A **FIRST** preliminary amendment.
14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information:
 1. Form PCT/IB/308
 2. Return Postcard

U.S. APPLICATION NO. 09/787172

INTERNATIONAL APPLICATION NO.
PCT/EP99/06594ATTORNEY'S DOCKET NUMBER
MULL 10121. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**Neither international preliminary examination fee (37 CFR 1.482)
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO
and International Search Report not prepared by the EPO or JPO \$1000.00International preliminary examination fee (37 CFR 1.482) not paid to
USPTO but International Search Report prepared by the EPO or JPO \$860.00International preliminary examination fee (37 CFR 1.482) not paid to USPTO
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00International preliminary examination fee (37 CFR 1.482) paid to USPTO
but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00International preliminary examination fee (37 CFR 1.482) paid to USPTO
and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	13 - 20 =	0	x \$18.00	\$ 0.00
Independent claims	3 - 3 =	0	x \$80.00	\$ 0.00

MULTIPLE DEPENDENT CLAIM(S) (if applicable) + \$270.00 \$

TOTAL OF ABOVE CALCULATIONS = \$860.00☐ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above
are reduced by 1/2. + \$**SUBTOTAL =** \$Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30
months from the earliest claimed priority date (37 CFR 1.492(f)). \$**TOTAL NATIONAL FEE =** \$Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property + \$**TOTAL FEES ENCLOSED =** \$860.00**Amount to be
refunded:** \$**charged:** \$

- a. ☒ A check in the amount of \$ 860.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees.
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No. 50/1039. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card
information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR
1.137 (a) or (b)) must be filed and granted to restore the application to pending status.**

SEND ALL CORRESPONDENCE TO.

Gary W. McFarron
Cook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd.
200 West Adams Street - Suite #2850
Chicago, IL 60606
Phone: (312) 236-8500
Fax: (312) 236-8176

Gary W. McFarron
SIGNATURE
Gary W. McFarron
NAME
27,357
REGISTRATION NUMBER

Attorney Docket No. MULL 101

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Ulrich Muller,
Detlef Winter,
Detlef Sonnenschein
Rudolf Stockmeyer,
Gustav Peuker

International Application No.:
PCT/EP99/06594

International Application Filing Date:
September 7, 1999

Priority Date: September 14, 1998

For: SYSTEM FOR MEASURING THE
SURFACE GEOMETRY AND SURFACE
EVENNESS OF FLAT PRODUCTS

"Express Mail" Mailing Label No. EL411702323
Date of Deposit March 13, 2001 US

I hereby certify that this correspondence is being
deposited with the United States Postal Service
"Express Mail Post Office to Addressee" service
under 37 CFR 1.10 on the date indicated above
and is addressed to: Commissioner
for Patents, Washington, D.C. 20231

Name Ruben M. Gomez
(typed or printed)

Signature Ruben M. Gomez

Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please enter this Preliminary Amendment prior to substantive
examination and prior to calculating the filing fee.

IN THE CLAIMS:

Please amend the claims as follows:

4 (Amended). Apparatus according to Claim 1, characterized
in that the projector illumination 23, 53 is regulated via the

evaluation of the grey shades determined by the camera 22, in order to achieve a suitable control of the camera 22.

5 (Amended). Apparatus according to Claim 1, characterized in that the exposure time and/or aperture of the camera 22 is regulated via the evaluation of the grey shades of the surface image determined by the camera 22, in order to achieve a suitable control of the camera 22.

6 (Amended). Apparatus according to Claim 1, characterized in that a camera 22 with non-linear sensitivity is used.

7 (Amended). Apparatus according to Claim 1, characterized in that projector 23, 53 and camera 22 span with the measurement points an angle which is less than 90° , and/or are arranged on the same side laterally next to the object 4 to be measured.

8 (Amended). Apparatus according to Claim 1, characterized in that projector 23, 53 and camera 22 are arranged next to one another or above one another above the object 4 to be measured.

9 (Amended). Method for measuring the strip geometry using an apparatus according to Claim 1, characterized in that elastic form changes are filtered using the initially detected peaks and the peaks are separated according to different frequencies and wavelengths on account of strip movements.

10 (Amended). Method for measuring the geometry of the strip edge using an apparatus according to Claim 1, characterized by the use of the edge boundary of the strip.

11 (Amended). Method according to Claim 10, characterized in that the strip width or cut length is determined from the edge boundary.

REMARKS

This is a Preliminary Amendment to the above-identified patent application.

In lines 1 and 2 of Claim 4, please delete "one of the preceding claims", and replace with --Claim 1--.

In lines 1 and 2 of Claim 5, please delete "one of the preceding claims" and replace with --Claim 1--.

In line 1 and 2 of Claim 6, please delete "one of the preceding claims" and replace with --Claim 1--.

In line 1 of Claim 7, please delete "one of Claims 1 to 6" and replace with --Claim 1--.

In line 1 of Claim 8, please delete "one of Claims 1 to 6" and replace with --Claim 1--.

In lines 2 and 3 of Claim 9, please delete "one of the preceding claims" and replace with --Claim 1--.

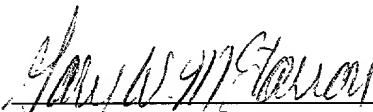
In lines 2 and 3 of Claim 10, please delete "one of the preceding claims" and replace with --Claim 1--.

In line 1 of Claim 11, please delete "11" and replace with --10--.

This Amendment is made to remove the multiple dependencies in Claims 4-10. Also, Claim 11 has been amended to correct the claim dependency. A clean version of each claim, as amended, is set

forth above and a marked-up version of each claim showing the changes is attached hereto, in accordance with 37 CFR 1.121.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Gary W. McFarron", is written over a horizontal line.

Gary W. McFarron
Attorney of Record
Registration No. 27,357

COOK, ALEX, McFARRON, MANZO,
CUMMINGS & MEHLER, LTD.
200 West Adams Street, Suite 2850
Chicago, Illinois 60606
(312)236-8500

FILED

VERSION WITH MARKINGS TO SHOW CHANGES MADE

4 (Amended). Apparatus according to [one of the preceding claims] Claim 1, characterized in that the projector illumination 23, 53 is regulated via the evaluation of the grey shades determined by the camera 22, in order to achieve a suitable control of the camera 22.

5 (Amended). Apparatus according to [one of the preceding claims] Claim 1, characterized in that the exposure time and/or aperture of the camera 22 is regulated via the evaluation of the grey shades of the surface image determined by the camera 22, in order to achieve a suitable control of the camera 22.

6 (Amended). Apparatus according to [one of the preceding claims] Claim 1, characterized in that a camera 22 with non-linear sensitivity is used.

7 (Amended). Apparatus according to [one of Claims 1 to 6] Claim 1, characterized in that projector 23, 53 and camera 22 span with the measurement points an angle which is less than 90° , and/or are arranged on the same side laterally next to the object 4 to be measured.

8 (Amended). Apparatus according to [one of Claims 1 to 6] Claim 1, characterized in that projector 23, 53 and camera 22 are arranged next to one another or above one another above the object 4 to be measured.

9 (Amended). Method for measuring the strip geometry using an apparatus according to [one of the preceding claims] Claim 1, characterized in that elastic form changes are filtered using the initially detected peaks and the peaks are separated according to different frequencies and wavelengths on account of strip movements.

10 (Amended). Method for measuring the geometry of the strip edge using an apparatus according to [one of the preceding claims] Claim 1, characterized by the use of the edge boundary of the strip.

11 (Amended). Method according to Claim [11] 10, characterized in that the strip width or cut length is determined from the edge boundary.

35 The German published Patent Application 197 09 992
discloses a method for measuring the surface geometry
of a metal strip, in which, using a light source, a
multiplicity of lines are produced by projection for

example with the aid of a line transparency on the strip surface.

For this purpose, a projector aligned with the strip surface to be measured is arranged above the strip. A transparency is provided between the projector and the strip surface to be measured, a stripe pattern being imagined on the strip surface through the said transparency. Strip unevennesses bring about a change in the lines projected onto the strip surface. A measuring apparatus, for example a CCD camera, arranged behind the projector in the running direction of the strip, can be used to detect the changes in the measurement lines on the strip surface.

In order to calibrate the system, the line pattern is projected onto a reference plane. A "calibration table" is used for this purpose. The images - acquired by the camera - of the reference plane and of the strip to be measured are evaluated and compared according to the "phase-shifting method". With this method, a phase image is generated from the camera image. Each pixel of the camera supplies a specific brightness value. A periodic brightness profile is present in the transverse direction with respect to the line pattern. With the aid of the phase-shifting method, a phase angle is assigned to each pixel. The phases obtained with the aid of the calibration table serve as a reference phase image. With the aid of the phase image obtained on the object to be measured and the reference phase image, it is possible to determine the actual peak differences on the object to be measured.

High-quality measurement results can already be obtained using this measuring system, but the system is limited in particular in terms of its variability and is capable of improvement with regard to the measurement sensitivity.

The invention is based on the object of providing a surface measuring system which is suitable for different types of flat products and yields
5 high-quality measurement results. Furthermore, the invention is based on the object of developing the measuring method described in the German published Patent Application 197 09 992 with regard to its possible fields of use and its resolution.

10

The problem of the invention is solved by the independent claims. Advantageous refinements are represented in the subclaims.

15 All independent aspects of the invention are utilized in the preferred overall system. According to one aspect of the overall system, camera and projector can span with the measurement points an angle which is less than 90° , and/or be arranged on one side of the flat
20 body at different heights. This results in a space-saving embodiment which considerably extends the local field of use of the measuring system, since in many applications there is insufficient space available above the flat body.

25

According to a further aspect of the invention, a transparency is arranged between projector and flat body and allows the electronic generation of a line pattern, for example via a transparent liquid-crystal
30 element. The optimal projection patterns for the individual case can thus be set by means of appropriate control or the computer system of the measuring system. This allows, for example, a combination of the line density, brightness and other properties of the
35 projected pattern which is adapted to the requirements. Thus, the situation where a separate transparency has to be used for each individual case of measurement and, in particular, thusly a transparency having the desired

PCT/EP99/06594

combination of projection properties has to be produced is avoided. This reduces the costs and time taken for the individual applications. The system according to the invention is thereby significantly more flexible
5 for different fields of use, in particular different surfaces.

Furthermore, this preferred embodiment of the measuring system according to the invention has, according to a
10 further aspect of the invention, a regulated control of the camera and illumination parameters. Aperture, exposure time and brightness of the projector are automatically regulated in such a way that all the pixels of the measurement region have the desired
15 control. This is particularly advantageous in the use of the measuring system according to the invention with cold strip. In this case, the properties can change continuously during measurement, for example due to reflection at the strip surface, and thus corrupt the
20 measurement signals.

The performance of the measuring system is increased by another aspect of the invention by the measuring camera having a non-linear sensitivity. This is advantageous
25 in particular when the changing reflection properties of a cold strip, for example, can no longer be compensated via the control with time and aperture adaptation. The non-linear sensitivity covers a considerable brightness spectrum, in a similar manner
30 to the human eye, so that all measurement situations can be accurately detected.

For further improvement of the quality of the measurement results, the signals can be filtered. In
35 particular during the measurement of metal strip in the rolling train, the measured values can be undesirably changed due to a displacement of the strip in the direction of the normal vector to the reference plane

or in other directions and by bending of the strip. The displacement of the strip in the direction of the normal vector is already largely compensated by the use of a projected line pattern. The displacement in other directions or bending of the strip can be differentiated by filtering the surface changes as a result of strip unevenness, since the wavelengths of the respective movement components differ. Furthermore, this strip movement produces "developable areas", while the surface evenness is based on the non-developable component. On this basis, the filtering described can be used to represent a measurement signal which exclusively contains a statement about the strip unevenness. The values determined are preferably used to generate a suitable virtual compensation area with which undesirable displacement and bending can be compensated computationally.

In the preferred system, the measuring system is calibrated without the customary physical reference plane at the measurement point, by using arbitrary fixing points of the installation in order to generate a computational reference plane. This reference plane can be used to set the system both with regard to the peak differences and with regard to the longitudinal calibration. This avoids the use of the unwieldy and heavy physical reference plane, reduces the required space for measurement and avoids difficulties in bringing the reference plane into the position required for calibration. Furthermore corruption of the measurement signal as a result of unevennesses of the reference plane, which generally lie between +0.5 and - 0.5 mm, is avoided.

35 From the camera image it is possible to determine not only the peaks of the strip surface of the running strip but also, in the case of non-continuous strips, such as e.g. hot strip or heavy plate, the peaks at the

start and end of the strip, in particular the "ski",
i.e. upward or downward bending.

In addition to the peaks, the border can be determined
5 from the image data. The said border comprises the
strip width, the strip sabre and the generally
curvilinear boundaries of the start of the strip and
end of the strip. The method described thus also
detects e.g. curvilinearly bounded ends, so that it is
10 also possible for the rolling installation to be
corrected for the subsequent strip with the aid of this
measuring method.

The measuring method can furthermore be used for
15 determining the optimal cut length.

The invention is explained in more detail below using
an exemplary embodiment illustrated in the drawing.

20 In the drawing:

Fig. 1 shows a diagram of the regulated control of the
measuring system;

25 Fig. 2 shows an illustration of an arrangement of
projector and camera;

Fig. 3 shows strip form faults such as sabre, ski,
curved strip ends and the strip edges for
30 determining the strip width;

Fig. 4 shows a flow diagram for the sequence of a
measurement operation;

35 Fig. 5 shows a liquid-crystal element.

The regulated control of the overall system as shown in
Fig. 1 reproduces the conventional construction of a

measuring system above the broken line, while the measuring system regulation according to the invention is discernible below the broken line. In this case, in the process computer 1, the grey-shade values generated by the CCD camera 2 are evaluated quantitatively and related to the sensitivity range prescribed by the CCD camera 2. In order to effect measurement in the optimal sensitivity range, the parameters time, aperture and illuminance of the projector 3 are then regulated.

10

Fig. 2 reveals the arrangement of projector 23 and camera 22, which takes up a significantly smaller space above the strip 4 than conventional systems. In this case, camera 22 and projector 23 can be arranged above one another above the strip or above one another next to the strip. Likewise, camera 22 and projector 23 can be arranged next to one another on one side of the strip or above the strip 4.

20 The evaluation of the grey shades with regard to the strip geometry is effected according to the customary phase-shifting method with additional filtering of the undesirable measured-value components.

25 The latter may result from strip movements in the direction of the strip thickness. This direction is the direction of the normal vector to the reference plane. On account of oscillation and bending, then, these strip movements may differ at the individual strip locations. This would result in an error in the measured surface evenness. These undesirable measured-value components are filtered out from the primary measured components. It is assumed here that these undesirable measured-value components differ in frequency and wavelength from the measured-value components which are attributable to the surface evenness to be measured.

F02T09/00

Fig. 3 a illustrates the strip form fault "sabre" of the strip 4.

Fig. 3 b illustrates a further strip form fault "ski" of the strip 4. This strip form fault is detected, on the one hand. On the other hand, however, this deformed strip section is excluded from the strip length over which the surface evenness is measured.

The flow diagram illustrated in Fig. 4 reveals the sequence of a measurement operation in which, with the aid of the CCD camera, the strip edges are determined and evaluated by the computer in order finally to be used for the regulation of the rolling train.

The rolling train 41 produces a strip form whose characteristic values 43, such as surface evenness, sabre, ski and strip width, are detected by the measuring system 42. These are fed to a multi-variable regulator 44, which prescribes desired value changes of different manipulated variables on the rolling train.

Fig. 5 schematically shows the function of a liquid-crystal transparency 51, 52 in conjunction with the measuring system. 51 shows a detail of the transparency 51, 52 over a wavelength $\Delta\lambda$. Two mounting locations of the projector are shown, which correspond to the liquid-crystal transparencies 51, 52, and a light beam at the start and at the end of a wavelength is illustrated in each case. The camera 53 is shown perpendicular to the strip 54, the camera angle being arbitrary. The aim is to obtain a constant wavelength λ in the image, irrespective of the position of the projector and camera 53. This aim is achieved by suitably changing the wavelength in the transparency 51, 52 by a program. Consequently, the optimal transparency is in each case set for the prescribed projector and camera angle.

Claims:

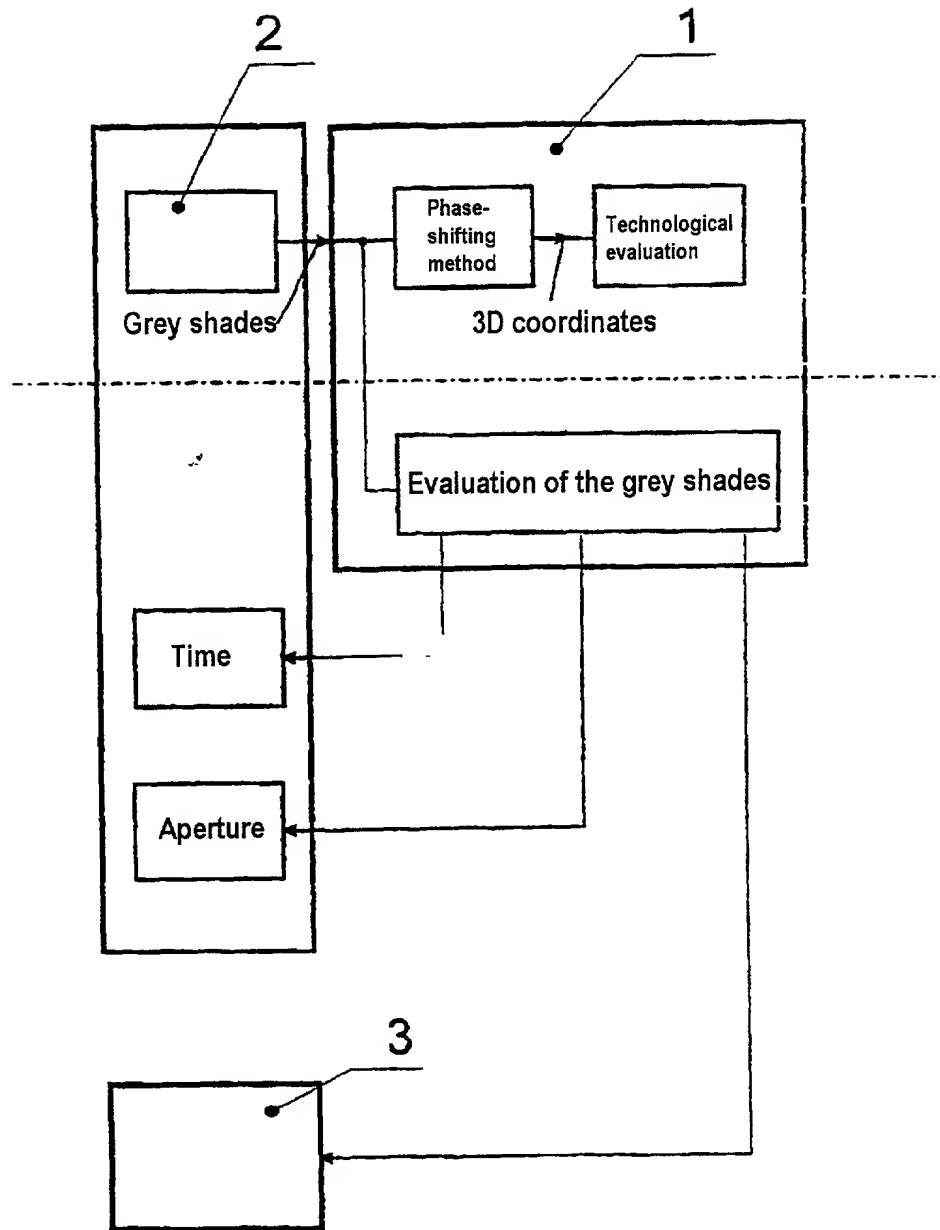
1. Apparatus for measuring the geometry and surface evenness of metal strip by producing a pattern on the surface to be measured, using a light source and a camera, **characterized in that** the pattern is produced on the surface 4 to be measured by projection with the aid of a transparency, 51, 52.
2. Apparatus according to Claim 1, **characterized in that** a changeable pattern is produced.
3. Apparatus according to Claim 2, **characterized in that** the pattern is produced with the aid of a liquid-crystal device 51, 52.
4. Apparatus according to one of the preceding claims, **characterized in that** the projector illumination 23, 53 is regulated via the evaluation of the grey shades determined by the camera 22, in order to achieve a suitable control of the camera 22.
5. Apparatus according to one of the preceding claims, **characterized in that** the exposure time and/or aperture of the camera 22 is regulated via the evaluation of the grey shades of the surface image determined by the camera 22, in order to achieve a suitable control of the camera 22.
6. Apparatus according to one of the preceding claims, **characterized in that** a camera 22 with non-linear sensitivity is used.
7. Apparatus according to one of Claims 1 to 6, **characterized in that** projector 23, 53 and camera 22 span with the measurement points an angle which is less than 90° , and/or are arranged on the same

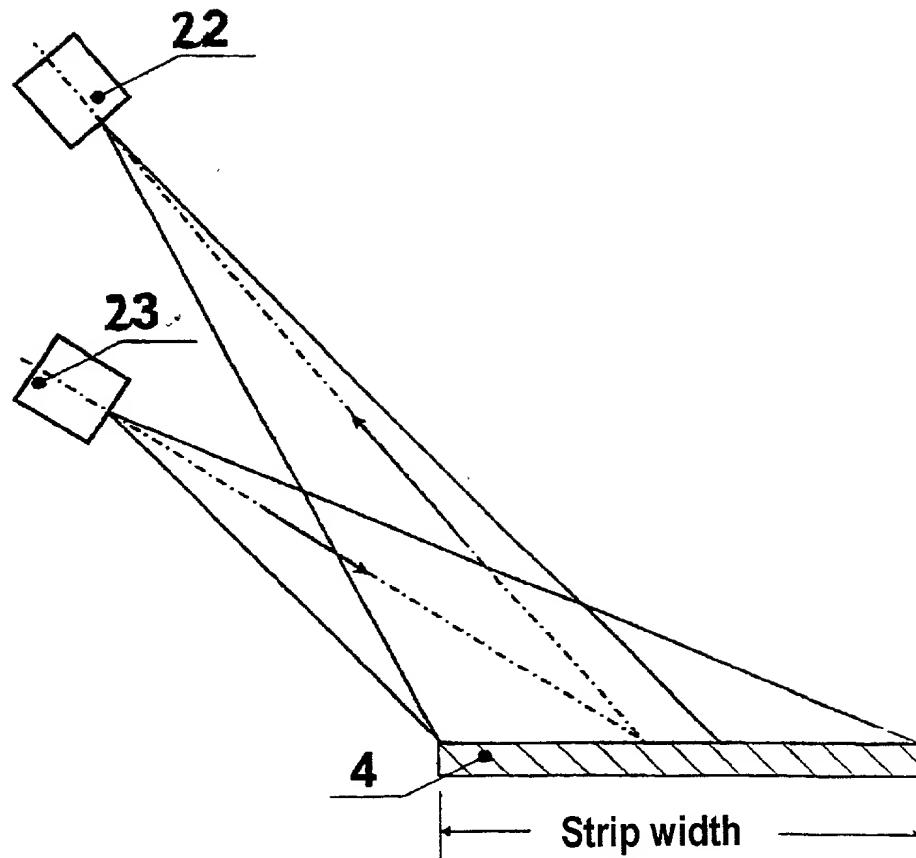
side laterally next to the object 4 to be measured.

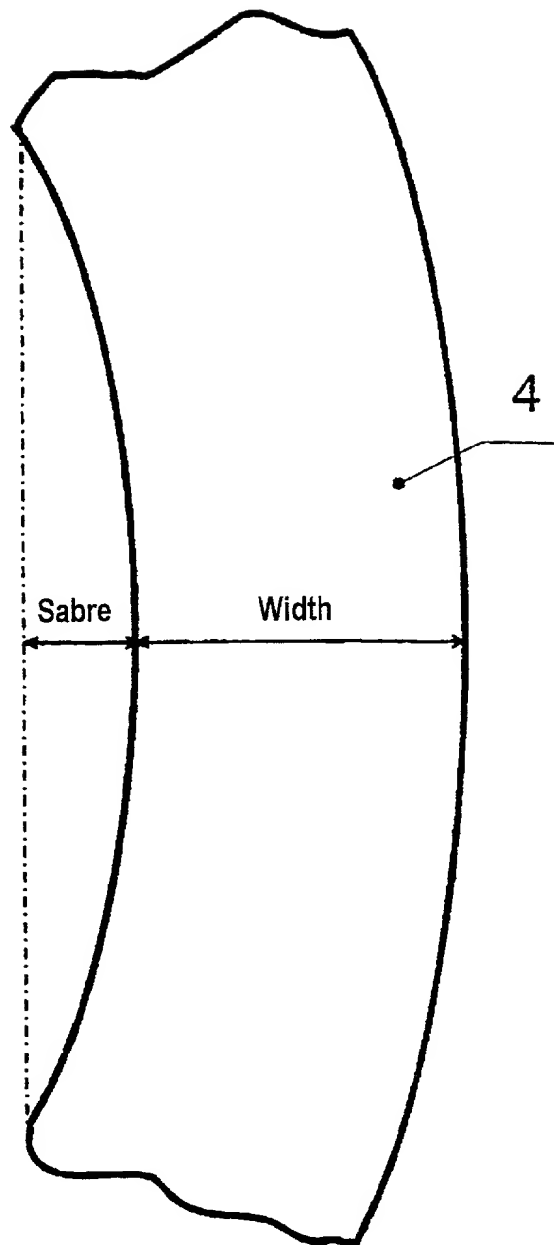
8. Apparatus according to one of Claims 1 to 6,
5 **characterized in that** projector 23, 53 and camera 22 are arranged next to one another or above one another above the object 4 to be measured.
9. Method for measuring the strip geometry using an
10 apparatus according to one of the preceding claims, **characterized in that** elastic form changes are filtered using the initially detected peaks and the peaks are separated according to different frequencies and wavelengths on account of strip
15 movements.
10. Method for measuring the geometry of the strip edge using an apparatus according to one of the preceding claims, **characterized by** the use of the
20 edge boundary of the strip.
11. Method according to Claim 11, **characterized in that** the strip width or cut length is determined from the edge boundary.
25
12. Method for measuring the strip geometry, **characterized by** computational generation of a reference plane and of a reference phase image from the geometry of the known measuring device
30 elements.
13. Use of an apparatus for measuring the geometry and surface evenness of flat products by producing a pattern on the surface to be measured, using a
35 light source and a camera, in which the pattern is produced on the surface 4 to be measured by projection with the aid of a transparency, 51, 52,

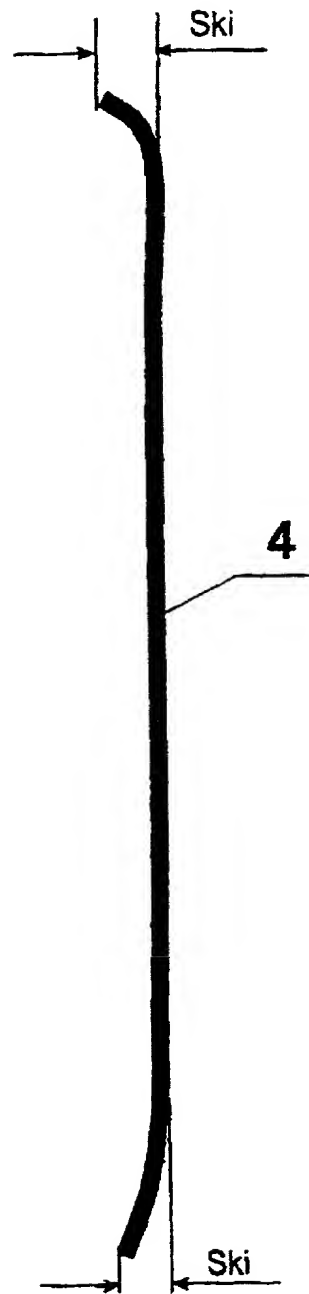
for the purpose of measuring the surface of metal strip.

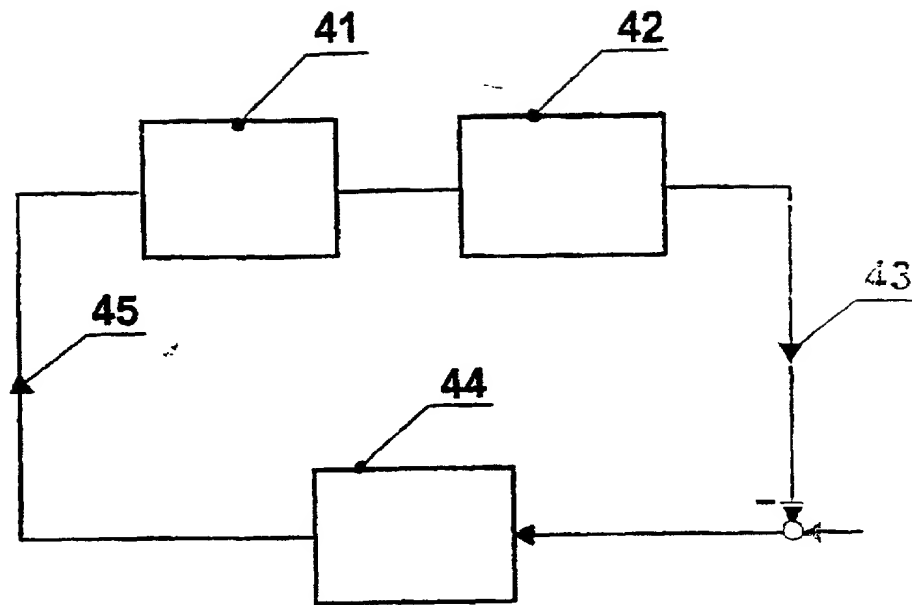
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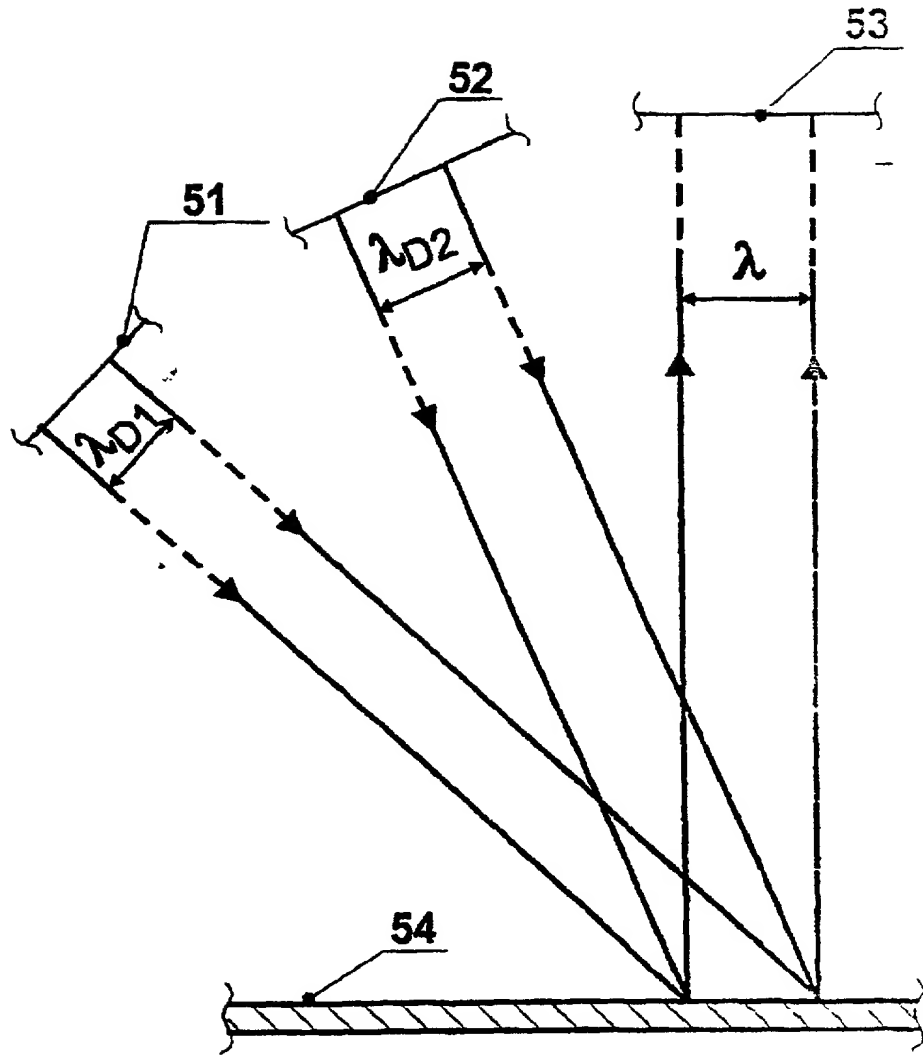
**Fig 1 .**

**Fig 2 .**

**Fig 3a.**

**Fig 3b.**

**Fig 4 .**

**Fig 5 .**

**DECLARATION FOR UTILITY OR
DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☐ Declaration Submitted with Initial Filing OR ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	MULL 101
First Named Inventor	Ulrich Muller
COMPLETE IF KNOWN	
Application Number	/
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SYSTEM FOR MEASURING THE SURFACE GEOMETRY AND SURFACE EVENNESS OF
FLAT PRODUCTS

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 09/07/1999 as United States Application Number or PCT International

Application Number PCT/EP99/06594 and was amended on (MM/DD/YYYY) 11/28/2000 (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
198 42 138.9	Germany	09/14/1998	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

[Page 1 of 2]

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DECLARATION — Utility or Design Patent ApplicationDirect all correspondence to: ☒ Customer Number or Bar Code Label ☐ OR ☐ Correspondence address belowName Gary W. McFarronCook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd.
Address 200 West Adams Street, Suit #2850City Chicago State Illinois ZIP 60606
Country USA Telephone (312) 236-8500 Fax 312-236-8176

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: ☐ A petition has been filed for this unsigned inventorGiven Name (first and middle [if any]) Ulrich Family Name or Surname MullerInventor's Signature M. Muller Date 11.04.01Residence: City 40789 Monheim State Germany Country German CitizenshipMailing Address Maria-Montessori-Strasse 59 DEXCity 40789 Monheim State Germany ZIP Germany CountryNAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventorGiven Name (first and middle [if any]) Detlef Family Name or Surname WinterInventor's Signature D. Winter Date 26.03.01Residence: City 38533 Vordorf State Germany Country German Citizenship
38527 MeineMailing Address Sandstrasse 8 Am Baukhop 40 DEXCity 38527 Meine State Germany ZIP Germany Country☐ Additional inventors are being named on the _____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

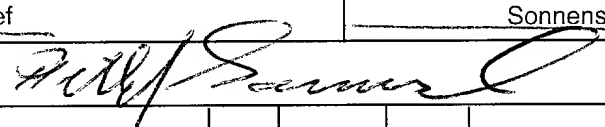
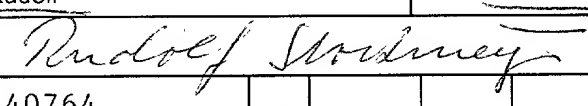
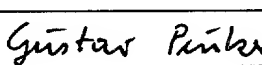
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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 1 of 1

Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Detlef				Sonnenschein			
Inventor's Signature						Date	23.4.01
Residence: City	45149	State		Country	Germany	Citizenship	German
Post Office Address		Schlingmannweg 32					
Post Office Address							
City	45149	State		ZIP		Country	Germany
City		Essen					
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Rudolf				Stockmeyer			
Inventor's Signature						Date	23.04.01
Residence: City	40764	State		Country	Germany	Citizenship	German
Post Office Address		Langenfeld					
Post Office Address		Johannesstrasse 8a					
City	40764	State		ZIP		Country	Germany
City		Langenfeld					
Name of Additional Joint Inventor, if any:		<input type="checkbox"/> A petition has been filed for this unsigned inventor					
Given Name (first and middle [if any])				Family Name or Surname			
Gustav				Peuker			
Inventor's Signature						Date	23.04.01
Residence: City	41066	State		Country	Germany	Citizenship	German
Post Office Address		Mönchengladbach					
Post Office Address		An den Hüren 75					
City	41066	State		ZIP		Country	Germany

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DECLARATION — Supplemental Priority Data Sheet

Additional foreign applications:

[illegible]

Additional provisional applications:

Application Number	Filing Date (MM/DD/YYYY)

Additional U.S. applications:

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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